AD-A062 596 ARMY INST OF DENTAL RESEARCH WASHINGTON D C F/G 6/9
EXTENT OF BACTERIAL CONTAMINATION IN A NONREBREATHING INHALATIO--ETC(U)
DEC 78 E A RUSSELL, A GROSS

UNCLASSIFIED NL

1 OF 1
ADA
062596

END
DATE
FILMED
3 -79
DDC

LEVEL II

12 pm

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Extent of Bacterial Contamination in a Nonrebreathing Inhalation Sedation Machine		5. TYPE OF REPORT & PERIOD COVERED Manuscript for publication. 5 Dec 77 - 8 Dec 78
		6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) Emery A. Russell, Jr. and Arthur Gross		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS U. S. Army Institute of Dental Research Walter Reed Army Medical Center Washington, DC 20012		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS 3S161102BS06 Task 04 OF 6024, Work Unit 012
11. CONTROLLING OFFICE NAME AND ADDRESS U. S. Army Medical Research & Development Command HQDA-IS Fort Detrick, Maryland 21701		12. REPORT DATE 8 Dec 1978
		13. NUMBER OF PAGES
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

This document has been approved for public release and sale; its distribution is unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

DDC RECEIVED DEC 28 1978 D

18. SUPPLEMENTARY NOTES

None

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Inhalation sedation, Bacterial contamination.

78 12 15 023

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

In this study the extent of bacterial contamination in a nonrebreathing inhalation sedation unit was determined. Bacteriological cultures of different areas of the Quantiflex MDM Machine were obtained during successive week-long courses in conscious sedation at this Institute. Results of the bacteriological cultures revealed the microbial contamination of nasal hoods before and after attempted disinfection with alcohol. The other areas of the unit were shown to be bacteria-free. Since attempted alcohol disinfection of nasal hoods was found to be ineffective, autoclave sterilization is therefore recommended.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

AD A062596

DDC FILE COPY

(9) Rept. for 5 Dec 77 - 8 Dec 78,

(6) EXTENT OF BACTERIAL CONTAMINATION IN A NONREBREATHING INHALATION SEDATION MACHINE.

(12) 13 p.

(11) 8 Dec 78

(10) Emery A. Russell, Jr., D.D.S., M.S.D.
Chief, Department of Oral Surgery

Arthur Gross, D.D.S., M.S.
Chief, Division of Oral Biology

U. S. Army Institute of Dental Research
Walter Reed Army Medical Center
Washington, D. C.

(16) 3S161102BS06

(17) 04

78 12 15 023

038 670

ABSTRACT

In this study the extent of bacterial contamination in a nonrebreathing inhalation sedation unit was determined. Bacteriological cultures of different areas of the Quantiflex MDM machine were obtained during successive week-long courses in conscious sedation at this Institute. Results of the bacteriological cultures revealed the microbial contamination of nasal hoods before and after attempted disinfection with alcohol. The other areas of the unit were shown to be bacteria-free. Since attempted alcohol disinfection of nasal hoods was found to be ineffective, autoclave sterilization is therefore recommended.

The effective sterilization of anesthetic and inhalation sedation units has always presented an enigma to the anesthetist.[1,2] The literature is replete with case reports of pulmonary infections in the post-surgical patient caused by contaminated anesthesia equipment.[3-5] These infections not only increase patient morbidity, but have led to death in some individuals.[6] Postanesthetic pulmonary infections are primarily associated with equipment which permits rebreathing of gases by the patient. A possible source of bacterial contamination has been shown to be the mask, breathing tubes, reservoir bag, and carbon dioxide absorber in the anesthetic systems which permit rebreathing.[7]

Many nonrebreathing anesthetic machines are presently in use for giving N_2O-O_2 inhalation sedation. At the United States Army Institute of Dental Research, we utilize the Fraser Sweatmen Quantiflex MDM inhalation sedation unit which provides a maximum of 50% nitrous oxide for conscious sedation.

Because of the proven bacterial pulmonary infections following administration of anesthetic agents using a circular rebreathing system,[3-6] we explored the extent of postanesthetic contamination of the nasal hood, breathing tubes, reservoir bag, and region of the nonrebreathing valve on the Quantiflex MDM anesthetic machine during use while teaching conscious sedation techniques at the USAIDR. This has permitted us to evaluate the extent of bacterial contamination of this nonrebreathing inhalation sedation unit during clinical usage following multiple administration of nitrous oxide and oxygen.

MATERIALS AND METHODS

The evaluation of bacterial contamination of the inhalation sedation units was conducted during routine dental appointments of 30-90 minutes duration. During the two parts of the study N_2O-O_2 inhalation sedation was administered to 195 patients using nine Fraser Sweatment Quantiflex MDM machines. All procedures used in both parts were similar, except that in the first part nasal hoods were swabbed by dentists with 2 x 2 isopropyl alcohol (90%) saturated gauze pads, while in the second part the swabbing was done by microbiological assistants using 4 x 4 gauze pads saturated with 70% or 90% alcohol. The interiors of the nasal hoods only were so treated immediately prior to use on patients. No attempt was made to disinfect other areas of the units to be studied. Two concentrations of isopropyl alcohol, 70% and 90%, were used to determine any marked differences in the disinfecting properties of alcohol when used for the purpose of nasal hood disinfection.

To determine the extent of microbial contamination of the inhalation sedation units, bacterial cultures of nasal hoods, breathing tubes, reservoir bags, and gas outlets in the area of the nonrebreathing valve were obtained using cotton swabs moistened in sterile saline. The areas of the machines that were cultured are shown in Fig. 1. The cotton swabs used for culturing were streaked on sheep blood agar plates which were incubated for 48 hours under aerobic conditions. Microbial counts on nasal hoods were determined (1) after attempted disinfection with alcohol, and (2) after the use of nasal hoods on patients.

RESULTS

The results of two parts of the study each conducted during five days of two different weeks, are shown in Table 1. In the first series of tests 2 x 2 gauze pads saturated with 90% isopropyl alcohol were used by eight dentists who were instructed to thoroughly wipe the interiors of the nasal hoods prior to patient treatment.

It is interesting to note that no bacterial contamination was evident on five nasal hoods immediately after use on patients. Eighty-seven bacteriological cultures of nasal hoods before attempted disinfection showed that bacterial counts varied from 0 to TNTC (too numerous to count). Alcohol swabbing occasionally reduced the bacterial contamination, increasing for example the number of bacteria-free nasal hoods to eight, and decreasing the incidence of heavily contaminated hoods with bacterial counts of more than 100 and TNTC. However, as seen in Table 1, the great majority of nasal hoods remained contaminated after alcohol swabbing, and the frequency of finding masks yielding counts of more than 50 but less than 100 bacteria even doubled in part one.

The failure to properly disinfect the nasal hoods with alcohol prompted us to reevaluate this accepted method of degerming in the second modified study in which the modification consisted of (1) using, in addition to 90% isopropyl alcohol, the same agent in 70% concentration on half of the hoods studied, and (2) swabbing the hoods with alcohol saturated 4 x 4 gauze pads by experienced microbiological assistants instead of the dentists.

The results of 108 determinations in part two of the study have shown (Table 1) that generally, the incidence of microbial contamination decreased after alcohol swabbing. Even before any alcohol treatment, in 15 cases the hoods revealed absence of bacteria after use; however, after alcohol treatment this number was increased to 50. Except for the higher number of hoods yielding less than five bacteria after attempted disinfection, the alcohol treatment decreased the frequency of microbial contamination, particularly as it pertained to hoods with relatively high bacterial contamination. It should be point out, however, that although some beneficial effect of alcohol swabbing was evident, only 50 bacteriological cultures out of 108 failed to reveal bacterial growth.

The data relative to the use of 90% and 70% isopropyl alcohol in the second part of the study was combined and presented in Table 1 since no significant differences in degerming the nasal hoods could be shown, irrespective of which alcohol concentration was used.

One hundred thirty-six bacteriological cultures of each of the areas (Fig. 1) examined, other than the nasal hood, revealed only occasional bacterial growth, not exceeding more than three colonies. This growth was considered to be the result of contamination of the blood agar plates that probably occurred from the air during the streaking of the plates.

DISCUSSION

This study revealed the extent of contamination of the Quantiflex MDM inhalation sedation unit to differ markedly from that reported for

anesthetic machines used to induce general anesthesia. This difference could be explained by the fact that the Quantiflex MDM inhalation sedation unit does not permit rebreathing of the gases and, therefore, prevents circulation of microorganisms through the reservoir bag. Theoretically, the breathing tubes would be more likely to become contaminated as they are located distal to the nonrebreathing valve. However, because of the direction of flow of the gases and the absence of moisture in the breathing tubes, it is felt that the environment is not favorable for bacterial growth. This may explain why no significant contamination of the breathing tubes was found to occur in this study.

Based on the results of the cultures, it would appear that the dentist who uses a nonrebreathing inhalation sedation unit in his practice should be concerned primarily with the sterilization of the nasal hood. We found both 90% and 70% isopropyl alcohol swabbing to be inadequate for the purpose. However, the nasal hood supplied with the Quantiflex MDM unit is autoclavable. In fact, one of the nasal hoods was autoclaved in excess of 35 times without clinical evidence of deterioration. It is recommended that the nasal hood be sterilized by autoclaving at a temperature of 250F (121C) under a pressure of 15 psi for a period of 20 minutes. The breathing tubes, reservoir bag, and machine could be cleaned and disinfected at weekly intervals to assure cleanliness and decrease the possibility of these areas being a source of cross-infection.

SUMMARY

A bacteriological study in which the nasal hood, breathing tubes,

reservoir bag, and area of the nonrebreathing valve on the Quantiflex MDM inhalation sedation unit were cultured, indicated that the nasal hood was the primary area of concern for bacterial contamination. One hundred and thirty-six cultures of areas other than the nasal hoods in this study in which 195 patients were rendered dental treatment under inhalation sedation, revealed no evidence of bacterial contamination.

Based on these results, it is recommended that the dentist using a nonrebreathing inhalation sedation unit be concerned primarily with sterilizing the nasal hood. This can best be achieved by autoclaving.

* * *

MILITARY DISCLAIMER

Commercial materials and equipment are identified in this report to specify the investigative procedures. Such identification does not imply recommendation or endorsement or that the materials and equipment are necessarily the best available for the purpose. Furthermore, the opinions expressed herein are those of the authors and are not to be construed as those of the U. S. Army Medical Department.

TABLE 1. Bacterial counts on nasal hoods before and after attempted alcohol disinfection.

	BACTERIAL COUNTS									
	0	<5	<10	<20	<30	<50	>50	>100	TNTC	TOTAL
Part 1.										
BEFORE	5	20	10	10	9	5	13	10	5	87
AFTER	8	14	9	10	6	9	27	4	0	87
Part 2.										
BEFORE	15	30	5	12	7	8	9	13	9	108
AFTER	50	37	4	10	2	0	2	0	3	108

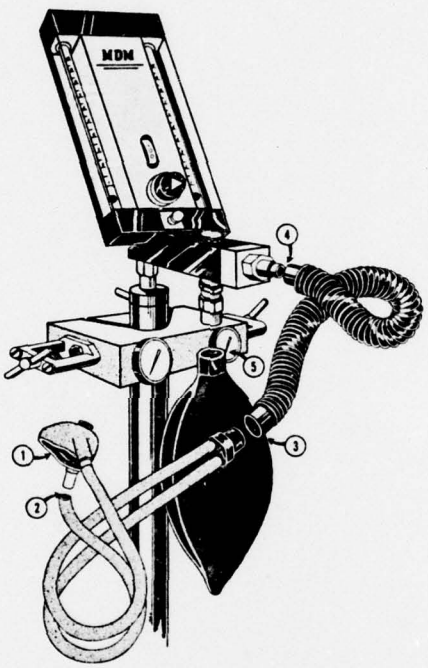

FIGURE 1. Inhalation sedation unit showing five bacteriological culturing sites.

Requests for Reprints to:

COL Emery A. Russell, Jr.
U. S. Army Institute of Dental Research
Walter Reed Army Medical Center
Washington, D. C. 20012

REFERENCES

1. Thomas, E.: Bacterial Hazards and Control in Anesthesia. AORN J. 19:88-95, 1974.
2. Roberts, R. B.: The Anesthetist, Cross-Infection and Sterilization Techniques - A Review. Anaesth. Intens. Care 1:400-406, 1973.
3. Joseph, J.M., Shay, E.E.: Disease Transmission by Inefficiently Sanitized Anesthetizing Apparatus. J.A.M.A. 149:1196-1198, 1958.
4. Roberts, R. B.: The Eradication of Cross-Infection From Anesthetic Equipment. Anesth. Analg. (Cleve) 49:63-68, 1970.
5. Dryden, G.E.: Uncleaned Anesthesia Equipment. J.A.M.A. 233:1297, 1975.
6. Tinne, J.E., Gordon, A.M., Bain, W.H., and Mackey, W.A.: Cross-Infection by *Pseudomonas Aeruginosa* as a Hazard of Intensive Surgery. Brit. Med. J. 4:313-315, 1967.
7. Jenkins, J.R.E. and Edgar, W.M.: Sterilization of Anaesthetic Equipment. Anaesthesia 19:177-190, 1964.